Organizing the nue effort

Milind Diwan

Goal

- Produce result by June 2006.
- Likely result: 1e20 protons
  - expected numu events: ~350
  - expected nue events: ~4 (theta_13=0)
  - expected background: ~15-20
  - expected error on background: 4(stat), 3(syst)

Things to do

- Decide on types of analysis
  - proposal: 3 analysis
    - computer based with current methods
    - computer based with alternate methods
    - eyescan based.
    - try to get one done by June.

Chris list.

Anybody looking for a new analysis direction, task list include

- Detailed study of backgrounds for the analysis
- Efficiencies from hand scanning
- Flux measurement using electrons
- New MC generation to study systematics
- Effect of Intranuke, different hadronization models...
- Beam related systematic issues
- Incorporating realistic systematics into fits
- Effect of blinding algorithm on electron analysis
- Lorentz Invariance study

- Get involved in the new production. Make sure the nue stuff is not screwed up. Nothing will cause more delay than this.
- Have a clear set of cuts for preselection. this should determine the data sets from 1) beam, 2) near det. 3) far det. to be used in the final analysis. Need to have this figured out completely by December. The data after December will just be small additions to this.

- Need a couple of new tools for completely satisfactory analysis.
  - Replacing muon in a CC event by an electron. This will give us a large sample of "electron" events based on data.
  - system for eyescanning efficiency, unless we abandon eyescan based analysis for the moment.

- Need a few critical analysis
  - Electron finding in near detector. Comparison to MC.
  - Near to Far shower energy calibration. Perhaps this comes from the CC group.
  - Efficiency for electron finding in near and far using MC and data (with muon replacement).

List of notes that are needed

- Data selection summary: 1) for beam, 2) ND, 3) FD. Preferably in one technical note. I urge this be done by December with updates in Jan. and Feb.
- Near detector electron finding. (T.J.'S note) timescale should be March meeting.
- 2 complete analysis notes by June: for computer based and second for eyescan based.

Some quatities

N_e: Number of ν_e candidates in far detector.
N_b^{mc}: Number of estimated background in far detector using MC.
N_b^n: Number of estimated background in far using near/far extr.
N_μ: Number of muon candidates in far detector with energy cut.
n_e: Number of ν_e candidates in near detector.
n_b^{mc}: Number of estimated background in near detector using MC.
n_e^{mc}: Number of estimated electrons in near detector using MC.
$B_{n/f}$: background extrapolation factor.
n_μ^b: Number of muon candidates in near detector with energy cut.
E_e: Efficiency of choosing ν_e events in far for total conversion.
e_e^n: Efficiency of ν_e selection in near detector.
E_μ: Efficiency for choosing muons in far detector with non-osc spec.
e_μ^n: Efficiency for choosing muons in near detector.
C_μ: correction factor for muon efficiency for oscillation.
C_e: correction factor for electron efficiency for oscillations.
Pot_f: Protons on target for far.
Pot_n: Protons on target for near.

The muon selection for this analysis for normalization only. It does not have to be the same as the muon disappearance analysis. If fact it should be simpler so that the efficiency can be estimated with small error.

$$N_b^n = (n_e - n_e^{mc}) \times B_{n/f} \times \frac{Pot_f}{Pot_n}$$

$$sin^2 2\theta_{13} = \frac{2(N_e - N_b^n)}{N_\mu} \times \frac{E_\mu}{E_e} \times \frac{C_\mu}{C_e}$$